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Exploring physical education teachers’ perceptions and attitudes towards digital technology in outdoor education

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ABSTRACT
In the Swedish educational system, there has been a recent push for digital technology in different school subjects. This paper investigates what regulates Swedish physical education teachers’ perceptions of digital technology in outdoor education. The results is reflected in a number of rules that govern Swedish physical education teachers’ perceptions and use of digital technology in outdoor education. Findings suggest that teachers’ views on the relevance of digital technology in outdoor education depends partly on curriculum formulations, but of significant importance are also other factors such as: the addressed knowledge area, grade level, choice of digital device, needs of students, and teachers’ ideological beliefs. These rules are discussed in relation to the construction of outdoor education as knowledge area within physical education and in relation to the ways in which Swedish physical education teachers relate to curriculum changes.

KEYWORDS
Digital technology; digital tools; physical education; outdoor education; Bernstein; mixed methods

Introduction
Digitalisation is a broad ideological and philosophical movement in contemporary society. It has had a huge impact on both primary and higher education, albeit in different ways and extents. This is also the case regarding the subject of physical education and physical education teacher education and the way outdoor education is implemented (see e.g. Barker et al., 2016; Bolliger, McCoy, Kilty, & Shepherd, 2020; Dyment, Downing, Hill & Smith, 2014). The opportunities and challenges involved in integrating digital technology with outdoor education are well documented. It has been suggested that digital technology can complement outdoor education and strengthen young people’s interest in outdoor education (Hougham, Nutter, & Graham, 2018; Paulsen & Andrews, 2019). One challenge with digital tools in outdoor education is that it can disconnect people from their awareness of the surrounding environment (Hills & Thomas, 2020; Smith, Parks, Parrish, & Swirski, 2018). Some researchers argue that by introducing digital technology, the goals of outdoor education, which are meant to encourage experiences in nature, are in themselves contested (Cuthbertson, Socha, & Potter, 2004; Wattchow, 2001). Thus, outdoor educators have different perspectives on the values of digital technology in outdoor education.

In the Swedish educational system, there has been a recent push to emphasise digital technology in different school subjects. In the case of outdoor education, which in Sweden is part of physical education subject area (Backman, 2011a; Mikael, 2017), digital tools were specified as required learning content in a revision of the physical education curriculum in 2018 (SNAE, 2018). The debates which followed regarding the role of digital technology in outdoor education provide a reason to
explore what has become of this development in Swedish school policy. Using the words of Basil Bernstein (2000), it may be that in Swedish schools the addition of digital tools as content in outdoor education (within physical education) may result in reconstructed outdoor pedagogic discourses, and that this process is governed by context-specific rules.

By investigating and analysing what regulates Swedish physical education teachers’ perceptions of the digital technology content in outdoor education, as recently introduced in the physical education curriculum, we intend to make these rules visible and to discuss some educational challenges following from them. More specifically, using a questionnaire that we developed which solicited written comments from participating physical education teachers, we will attempt to answer the following research questions:

What rules regulate how Swedish PE teachers perceive and implement digital technology in outdoor education?

Highlighting the relevance of digital tools in contemporary teaching contexts, and the attitudes of physical education teachers towards those tools is important, particularly against the contested backdrop of digital technology in outdoor education. When digital technology becomes part of an educational context, for example as a supplement to the physical education curriculum, this may result in the formation of new pedagogic discourses. In this process, Bernstein’s (1996) concept of the pedagogic device has been used for understanding the regulation of what teachers perceive as legitimate knowledge in educational contexts (Singh, 2002), such as for example in outdoor education (Backman, 2011a).

Digital technology in outdoor education

Technology, seen as a wide concept, has a relatively long history in the outdoors. Digital technology, on the other hand, is more recently implemented. Since around the year 2000, digital technology has awakened interest of both teachers and researchers when it comes to outdoor learning. It started when digital technology became more compact and mobile which empowered people to use these tools almost anywhere and at any time (Bolliger et al., 2020, Hills & Thomas, 2020).

Hills and Thomas (2020) have described how The Digital Technology in Outdoor Experiential Learning (DTOEL) framework can help outdoor educators make informed and considered choices when implementing digital technology in outdoor education. The key areas in the DTOEL framework are pedagogical considerations, affordances of digital technology and consequences of decisions. Digital devices that are occasionally used in outdoor learning are GPS, drones, video and smartwatch (Adam, 2008; Hills & Thomas, 2020; Porter & Wilson, 2019; Svendsen & Svendsen, 2020).

Several researchers suggest that digital tools may motivate students as well as strengthen their learning (Fauville et al., 2014; Hougham et al., 2018). Fauville et al. (2014), who are strong advocates of digital technology in outdoor education, assert that digital technology can improve the learning process in six different ways: 1. increase the communication between students and their teachers; 2. increase student motivation; 3. expand the range of pedagogical resources available; 4. facilitate for students in school to actively search for information rather than passively receiving facts; 5. deepen the understanding of principles and concepts and, 6. decrease students dependency on the teacher. Digital technology can also enable new experiences in environmental education and help to create new ways of learning. Fauville et al. (2014) suggest that digital tools can make it possible to overcome issues of economy, time and security, by enabling students to virtually visit remote places, or virtually do experiments that would not be possible in physical settings.

A challenge related to the use of digital tools is that they may involve devices that are produced without educational purposes, and that students and teachers might need support to be able to use them as pedagogical resources (J. T. Svendsen & Svendsen, 2020). Another challenge with the use of
digital tools in schools is that they are sometimes expected to replace the teacher. Research emphasises that the teaching and learning with digital tools is dependent on how teachers use them (Fauville et al., 2014; Svendsen & Svendsen, 2020).

Cuthbertson et al. (2004) point out that digital technology is often accepted and embraced by teachers with insufficient critical reflection. Without a reflected purpose with using digital technology, many of the positive impacts that students may experience in outdoor education are reduced. Other scholars have suggested that digital technology in outdoor education can cause a distraction from what could be learnt and experienced in the outdoors and can thus create a barrier between the learner and the outdoor environment (Eliasson, 2013; Hills & Thomas, 2020; Smith et al., 2018).

To conclude, research points to educational benefits as well as risks when using digital technology in outdoor education in schools. A thoughtful consideration of the why and the how with digital technology in outdoor education (and certainly in all educational practices) seems to be a non-negotiable condition for a successful implementation.

**Digital technology in the Swedish physical education curriculum**

In the Swedish context outdoor education has formed a significant part of the physical education curriculum (Backman, 2010). *Outdoor education* is one of three knowledge areas which, together with *Movement* and *Health and lifestyles*, constitute the central content in physical education (SNAE, 2018), although it has often been limited by factors such as the environment, resources and group size as well as students’ and teachers’ level of knowledge (Backman, 2011a).

In 2018, digital technology was introduced into the physical education curriculum for Swedish compulsory schools (SNAE, 2018). This was the culmination of a digitalisation process that had been gradually progressing. Televisions and video and tape recorders, which were once considered state-of-the-art digital tools, have now been replaced with geo-positioning devices, tablets and smartphones (Fauville et al., 2014; van Hilvoorde & Koekoek, 2018). What is new since 2018 is that physical education teachers in Swedish compulsory schools are now specifically obliged to include digital tools as part of their outdoor education teaching. This can be seen in the new stipulated learning content in the Swedish physical education curriculum, as follows (with new text appearing in bold): (SNAE, 2018, pp. 50–51 [bold text added]).

1. ‘Using maps, both with and without digital tools, to orient oneself in the surrounding nature and outdoor environment. The structure and symbols of maps.’ (Years 4–6).
2. ‘Digital and other tools to plan, perform and evaluate movement activities.’ (Years 7–9).
3. ‘Orientation in unfamiliar environments using maps and other aids to locate position, both with and without digital tools.’ (Years 7–9).

In upper secondary school in Sweden however, no recent additions have been made in the physical education curriculum concerning digital tools, although it is stated in the overall goals (for all subjects) that the students should be able to ‘use books, library resources and modern technology as a tool in the search for knowledge, communication, creativity and learning’ (SNAE, 2018). The first and the third of the new curriculum formulations in compulsory school above have a clear connection to orienteering, which in Swedish physical education is positioned within the knowledge area *Outdoor education*. The second formulation is positioned within the knowledge area *Movement* but is in practice also implemented in outdoor education. In Swedish physical education research there is a ‘grey zone’ between the categorisation of activities as outdoor education or outdoor sports. For example, while orienteering ‘belongs to’ *Outdoor education* and aquatics ‘belongs to’ *Movement* on a curricular level (SNAE, 2018) these activities are often blended in practice (Backman, 2010). The curricular changes within outdoor education identified above may have an effect on Swedish physical education teachers’ perceptions of what they are obliged to teach and may therefore result in reconstructed pedagogic discourses regarding teaching in outdoor education.
Table 1. The arena of the pedagogic device.

<table>
<thead>
<tr>
<th>Field of practice</th>
<th>Form of regulation</th>
<th>Kinds of symbolic structure</th>
<th>Typical agents</th>
<th>Typical sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (where knowledge is produced)</td>
<td>Distributive rules</td>
<td>Knowledge structure</td>
<td>Academics, professional historians</td>
<td>Research papers, conferences, laboratories</td>
</tr>
<tr>
<td>Recontextualisation (where knowledge is selected and sequenced into curriculum documents or textbooks)</td>
<td>Recontextualising rules</td>
<td>Curriculum</td>
<td>Official Recontextualising Field (ORF): Curriculum writers, Pedagogic Recontextualising Field (PRF): teacher educators, textbook writers</td>
<td>Curriculum policy, textbooks, learning aids</td>
</tr>
<tr>
<td>Reproduction (where teachers transmit and evaluate knowledge)</td>
<td>Evaluative rules</td>
<td>Pedagogy and evaluation</td>
<td>Teachers</td>
<td>Classrooms and examinations (assessment tasks)</td>
</tr>
</tbody>
</table>

Note. This table demonstrates the field of practice in the pedagogic device. In this article, we have concentrated on the right column (reproduction), this table shows how reproduction is related to the other fields in the pedagogic device by Bernstein (2000) as interpreted by Bertram (2020).

Theoretical framework

Our research interest in this paper is directed towards the implications of the addition of digital technology in the Swedish physical education curriculum for compulsory schools (SNAE, 2018). In order to examine physical education teachers’ perceptions of digital technology we adopt Bernstein’s (2000) theory of the pedagogic device, as interpreted by Bertram (2020) in Table 1. This theory explains how content knowledge is produced and transformed through a process of production, recontextualisation and reproduction. During this process, a complex set of rules regulate how different pedagogic discourses take shape (Bernstein, 2000; Singh, 2002). In this study we investigate the regulation of pedagogic discourses when digital technology is introduced in outdoor education.

The empirical material generated for this article concerns the field of reproduction (far right-hand column, Table 1). Based on a questionnaire with physical education teachers, we aim to analyse the evaluative rules that regulate teachers’ perceptions of digital technology in outdoor education within a physical education context. The boxes in Table 1 are not to be understood as separated from each other by distinct boundaries. We have included horizontal and vertical arrows to emphasise what we see as relational aspects between the rows and columns in Table 1. For example, the recontextualisation field, in which curriculum goals are formulated, is fundamental for understanding the context and conditions under which teachers operate in the reproduction field. Evaluative rules are produced in meetings between teachers and agents from the official recontextualisation field, with guidance and support provided by the individuals and materials which occupy the pedagogical recontextualising field. All of the stakeholders operating in these fields, that is, the outdoor educators, physical education teachers, policy writers, textbook writers, teacher educators, and producers of digital technology, are involved in the process of reproduction in one way or another. Some agents have more power and interpretive precedence than others but all of them influence what digital technology becomes, as a pedagogical resource, when it is reproduced in outdoor education. When digital technology is pedagogised within an outdoor education context, the pedagogic discourse has to ‘selectively appropriate, relocate, refocus and relate to other discourses to constitute its own order and orderings’ (Bernstein, 1990, p. 184).

Using Bernstein’s (2000) theory of the pedagogic device, and focusing specifically on his concept of rules, our research question reads: what rules regulate how Swedish PE teachers perceive and implement digital technology in outdoor education? Investigating the pedagogic discourse of outdoor education when introducing digital technology into the physical education curriculum can further illuminate how Swedish physical education teachers relate to curricular changes.
Method

Design and participants

A questionnaire was designed and first distributed at a conference for physical education teachers in Stockholm in October 2019. This resulted in 73 participants. Two weeks later it was posted on an online forum for Swedish physical education teachers which resulted in 78 participants. The questionnaires at the conference were answered either electronically or on paper, while the responses from the online forum were digital only.

After the removal of 15 participants who did not actually work as physical education teachers, nor had a physical education teacher degree, 136 questionnaires were analysed. Most of the participants had many years of experience as physical education teachers teaching different school levels. Table 2 below shows the distribution of the participants grouped by years of teaching experience in grades 1–6, 7–9, and upper secondary school. The categories were constructed, partly based on the aim to get the participants evenly distributed in terms of teaching experience and grade levels, and partly based on research on development of teacher knowledge (e.g. Darling-Hammond, 1999; King Rice, 2010).

As Table 2 shows, the teachers in this study are spread widely across the different categories, including a significant proportion who have more than 10 years of teaching experience. It is important to note here that although our focus does not concern upper secondary school, we nevertheless chose to include secondary school teachers in our research because we were interested in gaining a general overview of the attitudes of all teachers, regardless of their school level.

The instrument

The data analysed in this paper originates from a questionnaire used in a larger project. This questionnaire included 19 questions about different topics such as digital technology and environmental sustainability in physical education. In this paper we present answers to the questions that asked about digital technology and teachers’ perceptions of digital tools in different knowledge areas with a focus on outdoor education. In particular we analyse responses to the following questions:

1. In which knowledge areas have you used digital tools in your teaching?
2. Rate how relevant you think it is to use digital tools in each area in the subject of physical education (that is, whether or not you use digital tools).
3. Explain why (or why not) you think digital tools are relevant for use in outdoor education as a part of the subject of physical education.

Question 1 was answered with fixed options. Questions 2 were answered using a Likert scale with four fixed options, ranging from 1 (not at all) to 4 (to a very high degree). In Question 3, the participants were given a free-text box so they could enter, in their own words (no limit), their thoughts about the relevance or not of digital tools.

Table 2. Teaching experience for teachers divided into three school level groups.

<table>
<thead>
<tr>
<th>Teacher experience (years)</th>
<th>Grades 1–6 (N = 48)</th>
<th>Grades 7–9 (N = 55)</th>
<th>Upper secondary school (N = 33)</th>
<th>Total (N = 136)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–5 (n = 29)</td>
<td>12</td>
<td>12</td>
<td>5</td>
<td>29</td>
</tr>
<tr>
<td>6–10 (n = 33)</td>
<td>13</td>
<td>13</td>
<td>7</td>
<td>33</td>
</tr>
<tr>
<td>&gt;10 (n = 74)</td>
<td>23</td>
<td>30</td>
<td>21</td>
<td>74</td>
</tr>
</tbody>
</table>
**Analysis**

To achieve our aims, we adopted a type of mixed method called an *exploratory sequential design* which includes both quantitative and qualitative analysis. In this approach, quantitative data is analysed in the first step and qualitative data in the next step, in order to strengthen and nuance the analysis of the collected material (Creswell, 2013). The purpose of this approach is to gain a more in-depth understanding of teachers’ perceptions of the relevance of using digital tools in outdoor education.

The quantitative analysis addresses the ‘to what extent-aspect’ and the qualitative analysis addresses the ‘why-aspect’ of our research question: What rules regulate how Swedish PE teachers perceive and implement digital technology in outdoor education? The quantitative analyses were performed in IBM SPSS version 26 and Microsoft Excel using frequency analyses, cross tabulations, means comparisons and one-way independent analysis of variance (ANOVA) with *post hoc* tests of Games-Howell (to manage the different sample sizes). The results are reported using tables and one figure.

A qualitative thematic content analysis was carried out to help us understand the participants’ statements about why digital tools are relevant in outdoor education and enable us to analyse which rules seem to regulate their views (Smith & Sparkes, 2019). Seventy-six of the participants answered the free-text part in question 3, and their comments range from one word to 67 words and have been thematically analysed, without use of software, using the six-phase model defined by Smith and Sparkes (2019) of familiarisation, coding, clustering, compiling and editing. The analysis with themes and translations was discussed and ventilated at seminars with other researchers.

The participants’ answers were written in Swedish and then translated into English by the authors. The transcripts were read carefully several times to ensure that the translation and context were as correct as possible. One limitation was that the questionnaire was anonymous, which made it impossible to contact the participants in the study to get clarifications of their answers. Here the researchers’ interpretation became important, since this step was carried out by all of them. To ensure validity, the translations were then reviewed by a native English academic. The analysis, expressing aspects of the rules that regulate physical education teachers’ perceptions of the relevance of digital tools in outdoor education, resulted three themes: *It depends on what, when and for who; It does not add anything; and It is part of modern life.* Some of the teachers’ comments have been used as quotations to illustrate how they perceive the relevance of digital tools in outdoor education. These quotes are linked to participants’ ID numbers, which range from 1–151.

In the qualitative analysis of the teachers’ comments, the number of written comments related to each heading (of the total number of comments analysed) is indicated in parentheses. This is not intended to display the dominance or marginalisation of certain ways of perceiving the relevance of digital technology in outdoor education. However, providing an indication of the number of written comments related to each theme does say something about the representativeness of each theme in relation to the collected material as a whole.

**Ethical considerations**

When conducting this study, guidelines regarding informed consent, anonymity, confidentiality, consequences and the role of the researcher as stipulated by the Swedish Research Council (2015) were considered. It is not possible to identify individual questionnaires in the material. According to the local ethics committee at the authors’ university, no ethical review was needed given that no personal data was collected.
Results

To what extent is digital technology relevant in outdoor education?

Of the selected sample of learning areas associated with the subject of physical education included in Figure 1, orienteering and outdoor activities can be considered to ‘belong to’ the knowledge area Outdoor education in the Swedish physical education curriculum (SNAE, 2018). However, in teaching practice some of the movement activities listed here, such as outdoor sports and aquatics, can also be considered as outdoor education.

As can been seen in Figure 1, 63% (n = 86) of the physical education teachers consider digital tools as relevant in orienteering and even more 65,6% (n = 89) state that they actually use digital tools in their orienteering teaching. For the knowledge area of outdoor activities, a relatively low proportion of teachers consider digital tools as relevant (41,5%, n = 56) and use them in their teaching (40,4%, n = 55). When comparing these two results we note a possible connection between high staples for orienteering and the fact that the use of digital tools in orienteering is specified in the Swedish physical education curriculum (SNAE, 2018). Figure 1 also shows that teachers perceive digital tools to be relevant, and actually use them, in several other knowledge areas in physical education, for example dance (79,2%, n = 108) teachers perceive as relevant, (76,2%, n = 104) actual use), cardio and strength (77,9%, n = 106) perceive as relevant, (71,5%, n = 97) actual use, health (77,8%, n = 106 perceive as relevant, 68,9%, n = 94 actual use), and CPR (66,1%, n = 90) perceive as relevant, 48,3%, n = 66 actual use). We note that for these latter knowledge areas, the use of digital tools is not specified in the Swedish physical education curriculum (SNAE, 2018) but still the values for these knowledge areas are high.

The results in Figure 1 suggest that for orienteering, the specification of digital tools in the Swedish physical education curriculum (SNAE, 2018) may be seen as critical factors in physical education teachers’ choice of content. The high values displayed by the other knowledge areas (dance, cardio and strength, health, and CPR) may be explained by factors not related to the curriculum, for example the successful marketing of digital tools in certain movement and health practices (for the role of the Nintendo Wii Just Dance in dance education see Gibbs, Quennerstedt, & Larsson, 2017; for a consideration of the STRAVA application in cardio and

![Figure 1. Physical education teachers’ perception of the relevance of digital tools in different knowledge areas compared to the stated use of digital tools in these knowledge areas. Note. Dark blue indicates teachers (in percent) who consider digital tools relevant in selected knowledge areas in Swedish physical education. Light blue indicates teachers (in percent) who have used digital tools in within these knowledge areas. N = 136.](image-url)
strength education see J. T.; Svendsen & Svendsen, 2020). To conclude, Swedish PE teachers perceive digital technology as relevant in orienteering, however not as much in other content in outdoor education.

**Who thinks digital technology is relevant in outdoor education?**

Table 3 displays the mean values from question number 3 in the questionnaire (the Likert scale part of the question). In the table, the values are presented under the categories of teachers’ years of experience and teaching level.

The extent to which teachers in this study consider digital tools as relevant in outdoor education resulted in a mean value of 2.64 ($SD = .88$) for the entire group ($N = 137$) (Table 3), which indicates that the mean is between ‘agree to a low extent’ (value 2) and ‘agree to a rather high extent’ (value 3) on the Likert scale, leaning slightly more towards ‘agree to a rather high extent.’ There are slightly higher mean values the more experience teachers have. There are though no statistically significant differences between group means in the categories of teaching experience as determined by one-way ANOVA ($F(2, 133) = 1.075, p = .34$). However, the mean values for the teaching level categories determined by one-way ANOVA differ with statistical significance ($F(2, 127) = 4.079, p = .019$). Games-Howell post hoc tests indicate that teachers in higher grade levels find digital tools in outdoor education more relevant than teachers in lower grade levels (Table 3). For example, there is a statistically significant higher proportion of teachers in grades 1–6 compared to teachers in upper secondary school teachers, who do not find digital tools relevant in outdoor education, even though digital technology is specifically mentioned in the physical education curriculum for grades 1–6 (SNAE, 2018). The group mean difference between teachers in grades 1–6 compared to grades 7–9 shows the same picture, but is not statistically significant. Interestingly, teachers in upper secondary school, where the curriculum does not specify the use of digital tools, nevertheless find digital tools relevant for use in outdoor education.

**Why is digital technology relevant?**

A qualitative analysis of the teacher comments in this study can offer important answers to this question. The first theme, *It depends on what, when and for who* (reflecting a contingent attitude towards digital technology in outdoor education) comprises the opinion most commonly held by the teachers that the relevance of digital technology in outdoor education depends on a number of factors. The following two themes *It does not add anything* (reflecting resistance towards digital technology in outdoor education) and *It is part of modern life* (reflecting an acceptance of

<table>
<thead>
<tr>
<th>Teacher categories</th>
<th>$M$</th>
<th>$SD$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience 1–5 years ($n = 32$)</td>
<td>2.47</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>Experience 6–10 years ($n = 32$)</td>
<td>2.66</td>
<td>1.00</td>
<td>.708</td>
</tr>
<tr>
<td>Experience &gt; 10 years ($n = 70$)</td>
<td>2.74</td>
<td>.81</td>
<td>.904</td>
</tr>
<tr>
<td>Grades 1–6 ($n = 47$)</td>
<td>2.34</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Grades 7–9 ($n = 52$)</td>
<td>2.75</td>
<td>.88</td>
<td>.062 *</td>
</tr>
<tr>
<td>Upper secondary school ($n = 29$)</td>
<td>2.86</td>
<td>.83</td>
<td>.032 a</td>
</tr>
<tr>
<td>All teachers ($N = 137$)</td>
<td>2.64</td>
<td>.88</td>
<td></td>
</tr>
</tbody>
</table>

Note. Min = 1, Max = 4
* refers to the difference with Experience 1–5 years
a refers to the difference with Experience 6–10 years
* refers to the difference with Grades 1–6
a refers to the difference with Grades 1–6
digital technology in outdoor education) reveal two different attitudes toward the integration of digital technology in outdoor education. All three of these themes will be discussed in the following sections.

‘It depends on what, when and for who’ (25 of 76 comments)

Nearly one-third of the teachers in this study claim that the relevance of digital technology in outdoor education depends on: the outdoor knowledge area being addressed, the digital tool being used, when the digital technology is being used, and the varying needs of students themselves. Teacher 88 (grades 7–9) described the dependence of different knowledge areas in outdoor education by saying:

It all depends on what outdoor education/activity I teach about and around. If I teach about various outdoor techniques, wind protection construction and cooking, for example, digital tools can be useful as the students are usually allowed to film their construction and motivate the choice of place/environment and more.

Some teachers also claim that certain digital tools are more suitable than others in outdoor education. For example using smartphones to watch and record film seems a popular approach among some teachers. Teacher 150 (grades 7–9) says ‘Students can watch movies in advance about how to make a fire, set up windbreaks, etc. and rehearse these. Students can film how they do it, and in that way document their process.’

In the quote above, Teacher 150 (grades 7–9) uses film recording in two different ways, partly as a preparatory learning tool and partly as a mechanism for enabling students to record their own activities. The teachers in this study also suggest that the relevance of digital technology depends on where and when in the teaching process it is used, which is visible in the following quotation (Teacher 115, upper secondary school):

A great way to introduce outdoor education is by using digital tools (movies and information online). But I also think it is just as important that the student gets to try outdoor education “in action”, just like many other activities you do in physical education lessons.

In the quote above Teacher 115 (upper secondary school) suggests that digital tools are often used in the beginning of a lesson or a series of lessons. Some teachers in this theme describe it as an effective way of communicating a common ground before moving into the practical components of the lesson. Interestingly, this seems to be a strategy that Teacher 115 uses in different physical education knowledge areas.

Yet another dimension of this contingent attitude towards digital tools is expressed by Teacher 93 (grades 7–9) who suggests that the relevance of digital technology in outdoor education can depend on the students’ needs. Teacher 93 (grades 7–9) says: ‘In the outdoors, it is good to prepare some students for what will happen by providing information on different platforms or printouts. Especially for me who has many students who are new to Sweden.’

This quote indicates that teachers use digital technology to adjust their outdoor teaching to suit individual needs. As we have shown above, many teachers claim that the relevance of digital technology in outdoor education depends on when it is used, for who and in which outdoor knowledge area. We found more of these ideologically-grounded opinions in the following themes that we label *It does not add anything* and *It is part of modern life*.

"It does not add anything” (14 of 76 comments)

Some teachers give expression to the idea that the natural environment should be experienced ‘in reality’ with all the senses and should not be distracted by digital technology. For example, teacher 12 (grades 7–9) emphasise the distracting function in digital technology in ‘that students can find it difficult to adapt to the environment if they use digital tools.’ Other teachers are more occupied with the learning dimension in outdoor education. Teacher 42 (upper secondary school) states that ‘it
[digital technology] does not add anything to learning.’ Further, the health aspect is mentioned by teacher 85 (grades 1—6) who argue that humans need ‘to lower our stress levels’ and that ‘outdoor education is about relaxing and disconnecting.’

Several of the comments in this theme have a normative and ideologically-based character. For example, teacher 50 (grades 7—9) ascertain that digital technology ‘do not belong in outdoor education’ but in line with several other comments there is no explanation to why this is the case. One teacher simply states that ‘the focus should be on experiencing nature, not using digital technology’ (teacher 59, upper secondary school) while another writes that ‘in outdoor life, it feels good to have a free zone from the digital (teacher 133, grades 1—6). Instead, outdoor education is about ‘enjoying nature’ (teacher 109, upper secondary school) and to ‘be outside, feel, experience and learning things practically’ (teacher 119, grades 1—6).

‘It is part of modern life’ (9 of 76 comments)
The total acceptance of digital technology is a rare outlook in this study but some teachers do still express it. A few teachers state that digital technology can make outdoor education more attractive to young people. For example, teacher 111 (grades 7—9) writes that ‘sometimes students may find digital tools fun as they are perceived as something new and modern.’ Teacher 139 (upper secondary school) claims that it is important to keep up with contemporary developments and that “digital tools are part of everyday life”. Teacher 59 (grades 1—6) explains that ‘students can use their own mobile phones as a digital tool to take pictures and movies during lessons and bring them back to the classroom to use as a basis for discussion.’ Some teachers argue that digital tools can be a complement to their ordinary outdoor teaching. Teacher 52 (grades 1—6), for example, writes that ‘the tools should enhance activity, learning and exploration—not replace real outdoor activity!’

Being either totally resistant to or totally accepting of digital technology in outdoor education appears to be related to ideological, and largely unarticulated, convictions about what can be combined with what in a given teaching context. This acceptance of digital technology should not take away from the fact that the relevance of digital technology in outdoor education as contingent on other factors is the most common standpoint expressed by the teachers in this study.

Summary of results and analysis
In our analysis we have been inspired by Bertram’s (2020) interpretation of Bernstein’s theory of the pedagogic device (Table 4). We have modified her table and present what we see as the evaluative level with regards to Swedish physical education teachers’ perceptions and use of digital technology in outdoor education. The text in italics in Table 4 represents our study in the context of the evaluative level of the pedagogic device.

<table>
<thead>
<tr>
<th>Field of practice</th>
<th>Reproduction (where teachers transmit and evaluate knowledge) Digital technology in outdoor education within the Swedish physical education context</th>
</tr>
</thead>
</table>
| Form of regulation | Evaluative rules  
| | • Teachers’ views on the relevance and use of digital tools in outdoor education depends on: curriculum formulations (Figure 1) and the grade level of teaching (Table 3).  
| | • Further explaining factors for teachers’ perceptions of the relevance and use of digital tools in outdoor education may be: the addressed outdoor knowledge area, the used digital tool, when digital technology is used, and the various needs of students’ and teachers’ ideological beliefs and value orientations (Qualitative content analysis)  
| Kinds of symbolic structure | Pedagogy and evaluation Evaluation of teachers’ perceptions and use of digital technology in outdoor education.  
| Typical agents | Teachers Swedish physical education teachers  
| Typical sites | Classrooms and examinations (assessment tasks) Sites for outdoor education (often outdoors) |

Note. Table 4 shows the right column of Figure 1 and the arena of the pedagogic device with the evaluated rules found in this study.
An important factor for the context of this study is that formulations regarding digital technology in the physical education curriculum actually belong to the recontextualization field (see Table 1) in Bertram’s version of the pedagogic device. Since we have collected data from physical education teachers, however, our study is about what Bertram would classify as the reproduction field (Bertram, 2020). This field could also involve information about students’ actual learning. However, engaging with this element lies outside the scope of this paper. In Table 4 we have only included the reproduction field and left out the ones for production and recontextualization.

The results of this study can be reflected in a number of evaluative rules (see Table 4) that govern Swedish physical education teachers’ perceptions and use of digital technology in outdoor education. We argue that from these rules follows a number of educational challenges.

One challenge follows the choice of orienteering as the content area in which digital technology is specified. Historically, orienteering has been central in Swedish physical education, and has been seen both as an activity and as an aim of learning (Backman, 2011b; SNAE, 2018). Swedish physical education teachers appear to be able to articulate learning goals in orienteering more explicitly than in other parts of outdoor education (Backman, 2011b). The specification of digital technology in orienteering (SNAE, 2018) must be understood in relation to the strong position that orienteering has gained in Swedish physical education. This observation draws attention to the possible need for other ways of thinking about outdoor education and the specification of digital technology.

Interestingly, the results in Table 3 show that teachers in upper secondary school find digital technology more relevant than teachers in compulsory school (grades 1–6 and 7–9). This is the case even though digital technology is not mentioned in the subject specific curriculum for upper secondary school but is specified for compulsory school. This result is one of the reasons why upper secondary teachers are included in this study although the amendment in the subject specific curriculum regarding digital technology only concerns the compulsory school. This acceptance of digital technology amongst upper secondary school teachers raises additional questions about the influence of educational policy. As we have shown in Table 4 and in the thematic analysis, teachers’ views on the relevance of digital technology in outdoor education depends on other factors besides the curriculum. These will be elaborated in the following discussion.

**Discussion**

In this section we will discuss the educational challenges which the results of the foregoing study have raised.

**Digital technology as constructed, recontextualized and reproduced content knowledge in outdoor education (in a physical education context)**

Outdoor education has a long tradition as an important knowledge area in the physical education context in Sweden (Backman, 2010). The position of orienteering in outdoor education is and has for a long time been strong in Swedish physical education (Backman, 2011b). The fact that orienteering was chosen as the knowledge area within physical education for the introduction of digital technology says something about how digital technology is perceived in physical education. In the official recontextualization field, where curriculum writers set the agenda for how physical education teachers are to perceive educational policy reforms (Bernstein, 2000; Bertram, 2020), orienteering is acknowledged and strengthened in its status among Swedish physical education teachers through the addition of digital technology to its curriculum requirements.

A possible reason for choosing orienteering as the knowledge area for digital technology lies in the development of GPS as a digital technique and the subsequent development of numerous products and devices (see Adam, 2008; Hills & Thomas, 2020; Porter & Wilson, 2019; J. T. Svendsen & Svendsen, 2020 for further discussions on digital devices in educational practices). Strongly associated with the GPS technique are also the ideas of risk reduction and safety (Bolliger et al., 2020).
A pedagogic discourse in outdoor education that is centred around orienteering as a site for the use of digital tools may foster a certain way to think about digital technology in outdoor education. What seems so far to have been excluded from this digital pedagogic discourse in Swedish physical education is, for example, the idea that different types of outdoor activities can have an impact on environmental sustainability (Backman, 2010). A digital way to learn about humans’ environmental impact is for example to calculate ecological footprints. This and other related areas can add further dimensions to digital education in the outdoors, which can contribute to greater interest among pupils and students (Fauville et al., 2014; Hougham et al., 2018; Mikael, Backman, & Lundvall, 2016).

Factors other than the curriculum that regulate digital technology in outdoor education

Our study shows that factors other than the physical education curriculum influence teachers’ attitudes towards digital technology in outdoor education. For example, the results show that it is more common among teachers in upper secondary school, compared to those in compulsory school, to value digital technology in outdoor education. The reasons for this might be found in the teachers’ background, habitus and value orientations (see for example, Backman, 2009; Curtner-Smith & Meek, 2000), their familiarity with digital technology and their expectations surrounding its use in teaching and learning. Other reasons might point to students’ own agency, and their greater or lesser exposure to digital technology. The relatively low relevance that teachers in grades 1–6 grant to digital technology in outdoor education (see Table 3) might be partially explained by the fact that it is more common among children above the age of 13 than among younger children to have their own smartphone (and thereby teachers can arrange learning situations in which pupils need access to smartphones).

Results from this study indicate that ideological convictions appear to shape some teachers’ attitudes towards digital technology in outdoor education. Rather than totally resisting, or totally and without critical reflection embracing digital technology, we believe that teachers need to make well informed decisions about why, when, where and in what way to include digital technology in outdoor education (see Cuthbertson et al., 2004 for a discussion). This study suggests that factors other than the curriculum really do matter. Perhaps these factors are important to acknowledge if teachers are to maintain a critically reflective teaching practice. The results draw attention to the relatively weak alignment between the stipulated curriculum content regarding digital technology and the perceived relevance of digital technology for teachers of younger children. According to Siskind et al. (2020) education and research should support teachers in their work with digital tools in the context of outdoor learning and to integrate these with each other to teach in line with the curriculum. In addition, having an increased awareness of the importance of different learning experiences could guide both teacher educators and teachers in training to incorporate them into practice with the aim of promoting optimal learning and development among students. It might also be a need of helping teachers develop knowledge concerning how to use digital technology as a pedagogical support.

Conclusions

The evaluative rules (Bernstein, 2000; Bertram, 2020) that regulate how Swedish physical education teachers perceive and implement digital technology in outdoor education are: curriculum formulations, grade level, outdoor knowledge area, the used digital tool, when digital technology is used, students’ needs, and teachers’ ideological beliefs and value orientations. The influence of these rules varies with school context and individually.

One important conclusion from these displayed rules is that they indicate the continuing dominance of orienteering in outdoor education within physical education. We argue that the hegemonic position which orienteering occupies (Backman, 2011b), which in this study is displayed
through the introduction of digital technology, risks overshadowing and slowing down the development of other knowledge areas in outdoor education such as environmental sustainability and place pedagogy (Mikaelis, 2017).

The rules also displays contradictions regarding the ways in which Swedish physical education teachers relate to curriculum changes, in particular the introduction of digital technology (SNAE, 2018). On the one hand, teachers appear to implement digital technology in orienteering according to the curriculum formulations. On the other hand, the relatively weak implementation of digital technology from teachers in lower grades (those that are, in fact, specifically governed by the introduction of digital technology in physical education policy documents), raises questions about the influence that curricular changes have in physical education compared to other factors such as teachers’ habitus and ideological value orientations (Backman, 2009; Curtner-Smith & Meek, 2000; Lundvall & Meckbach, 2008).

Further research

An interesting line of enquiry would be to explore what students are meant to learn when digital technology has been introduced into physical education. As mentioned before, digital tools themselves do not function as teachers because the teaching and learning is dependent on how these tools are used (Fauville et al., 2014; Gibbs et al., 2017; J. T. Svendsen & Svendsen, 2020). Further research into outdoor education could investigate in more depth how digital tools are used, the pedagogical intentions teachers adopt when using them and the objects of learning students are actually provided with. An additional research question might be to examine what is not learnt in outdoor education, given the existing research that suggests that digital technology can disconnect peoples’ awareness from the surrounding environment (Hills & Thomas, 2020; Smith et al., 2018) and even threaten the achievement of outdoor educational goals (Wattchow, 2001). Further research could investigate more in depth how digital technology are used, teachers’ pedagogical intentions with using them and what objects of learning are actually provided to students by using them.

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